SB 761
U7I54
1988

Service

Intermountain Region

Ogden, Utah

Forest Insect and Disease Conditions

Intermountain Region

1988

PHOTOGRAPHER: R. Ladd Livingston
Idaho Department of Lands
Coeur d'Alene, Idaho

COVER STORY: The gypsy moth larva pictured on the cover of this publication is the damaging lifestage of a major forest and urban pest. Gypsy moths, which are not native to North America, were accidentally introduced in the Boston area in 1869. Populations are now distributed throughout the New England and Middle Atlantic States. Remote infestations have been detected in many additional states including Washington, Oregon, California, Colorado, Idaho, and Utah. Within the Intermountain Region, an infestation was detected in 1988 in the Salt Lake City area. A cooperative eradication project has been planned in order to eliminate gypsy moths from this area.

FOREST INSECT AND DISEASE CONDITIONS

Intermountain Region

1988

Compiled by:
A. Knapp
J. Weatherby
J. Hoffman
V. Kalve
L. LaMadeleine

Forest Pest Management
State and Private Forestry
USDA Forest Service
Intermountain Region
324 25th Street
Ogden, Utah 84401

FOREST PEST MANAGEMENT
INTERMOUNTAIN REGION

Regional Office
324 25th Street
Ogden, Utah 84401
(801) 625-5257
FTS 586-5257

David G. Holland	Group Leader
Garth E. Baxter	Program Manager/Pesticide Coordinator

Ogden Field Office
324 25th Street
Ogden, Utah 84401
(801) 625-5458
FTS 586-5458

Leon A. LaMadeleine	Plant Pathologist/Ogden Field Office Representative
A. Steven Munson	Entomologist
Robert L. Mathiasen	Plant Pathologist
Valerie L. Kalve	Biological Technician

Boise Field Office
1750 Front Street, Room 202
Boise, Idaho 83702
(208) 364-4220
FTS 554-4220

Ralph E. Williams	Plant Pathologist/Boise Field Office Representative
R. W. Thier	Entomologist
Julie C. Weatherby	Entomologist
James T. Hoffman	Plant Pathologist
Joy C. Roberts	Computer Programmer Analyst
K. Andrew Knapp	Biological Technician
Philip J. Mocettini Jr.	Biological Technician
Marianne Rowe	Secretary

TABLE OF CONTENTS

Subject	Page
Introduction	1
Resume of Conditions	2
ENTOMOLOGY	
Bark beetles	
Mountain pine beetle	3
Spruce beetle	4
Douglas-fir beetle	5
Western pine beetle/pine engraver beetle	6
Jeffrey pine beetle	6
Defoliators	
Western spruce budworm	7
Douglas-fir tussock moth	7
Gypsy moth	8
Large aspen tortrix	8
Summary of insect conditions	9
PATHOLOGY	
Stem and branch diseases	
Dwarf mistletoes	11
Root diseases	
Root disease of nursery seedlings	11
Foliage diseases	
Douglas-fir needle cast	12
Vascular wilts	
Dutch elm disease	12
Ash yellows	12
Abiotic damage	
Drought effects	12
Summary of disease conditions	14
Recent publications	31

TABLE OF CONTENTS (CONT.)

Page

TABLES

Table 1. Number of trees killed by bark beetles in Region 4 during 1987-1988 as determined by aerial detection surveys. 17
2. Status of mountain pine beetle infestations by state during 1988. . 18
3. Status of spruce beetle infestations in Idaho during 1988. 19
4. Status of Douglas-fir beetle infestations by state during 1988. . . . 20
5. Status of western pine beetle infestations by state during 1988 . . . 21
6. Acres of defoliation by western spruce budworm in Region 4 during 1987-1988 as determined by aerial detection surveys 22
7. Status of western spruce budworm by state during 1988. 23
8. Dwarf mistletoe accomplishments - Intermountain Region, 1988. . 24

ILLUSTRATIONS

Figure 1. Areas infested by mountain pine beetle in Region 4 during 1988 as observed during aerial detection surveys. 25
2. Areas infested by spruce beetle on the Payette National Forest during 1988 as observed during aerial detection surveys. 26
3. Areas infested by Douglas-fir beetle in Region 4 during 1988 as observed during aerial detection surveys 27
4. Areas infested by western pine beetle and pine engraver beetle on the Boise and Payette National Forests as observed during aerial detection surveys 28
5. Areas infested by western spruce budworm in Region 4 during 1988 as observed during aerial detection surveys. 29

INTRODUCTION

This report briefly summarizes the status of insect and disease pests of forest trees in the Intermountain Region. Status of diseases is based largely on ground observations and surveys. Status of insects is based primarily on annual and special aerial surveys conducted over approximately 15 million forested acres in 1988 and, to a lesser extent, ground-based detection and evaluation surveys.

Numbers of trees killed and acreage of defoliation displayed in tables are estimates based on aerial survey information. These estimates are rounded to the nearest 50 units in the narrative.

Since information is collected in a similar manner each year, the information from maps and tables from various year's reports can be compared to determine trends.

RESUME OF CONDITIONS

Tree mortality caused by the mountain pine beetle decreased from 181,300 trees in 1987 to 63,000 trees in 1988. Nearly all of the decrease occurred on northern Utah and Wyoming National Forests. Significant increases in mortality occurred on the Challis and Salmon National Forests and within the Sawtooth Valley on the Sawtooth National Forest.

The spruce beetle continued to cause extensive mortality on the Payette National Forest where approximately 44,750 dying trees were detected by aerial detection survey. Smaller but increasing infestations are scattered through other areas of the Region.

The number of trees killed throughout the Region by the Douglas-fir beetle increased from 12,600 in 1987 to 87,550 in 1988. Significant increases in activity were detected on the Boise, Bridger-Teton, Caribou, Challis, Payette, Salmon, Sawtooth, Targhee, and Wasatch-Cache National Forests.

Western pine beetle, often associated with pine engraver beetle, killed approximately 42,700 trees in southern Idaho during 1988 compared to 9,950 trees in 1987. This is the largest western pine beetle epidemic ever recorded in the Region.

Acreage of western spruce budworm defoliation again decreased significantly with approximately 42,250 acres of defoliation detected during aerial surveys. This is the fewest acres of defoliation recorded in the Region since aerial surveys were begun in 1952.

The gypsy moth was detected in significant numbers for the first time in Utah. Approximately 1,100 acres of private lands and 100 acres of National Forest lands are targeted for eradication treatment in 1989. This treatment will be followed by extensive delineation surveys to better determine the extent of the infestation and required treatments for 1990.

Defoliation caused by the large aspen tortrix occurred on approximately 7,000 acres within the Dixie and Fishlake National Forests.

Douglas-fir needlecast was epidemic in southern Idaho in 1988 causing noticeable reddening but only slight defoliation of host trees in the spring and early summer.

Ash yellows was found on velvet ash in Zion National Park. This location and Las Vegas, Nevada, are the only known infection centers in the western United States.

Besides predisposing trees to beetle attacks, the drought during 1986-1988 resulted in premature needle drop of mature ponderosa pine, death of Douglas-fir and ponderosa pine seedlings in exposed areas, and leaf scorch of deciduous trees.

BARK BEETLES

With the exception of the much reduced mountain pine beetle activity on the Ashley and Wasatch-Cache National Forests, substantial increases in tree mortality caused by other species of bark beetles generally occurred throughout the Region. Three drought years, combined with heavy fire activity and previous western spruce budworm defoliation, have increased the susceptibility of many stands resulting in the observed increases in beetle activity. Populations of several species of beetles appeared to build in scorched trees in and around fire areas initially; and, after 1 to 3 years, moved to adjacent stands. The largest western pine beetle outbreak ever recorded in the Region is causing extensive mortality in second-growth, moisture-stressed ponderosa pine; and the largest Douglas-fir beetle outbreak since the early 1970's is causing heavy mortality in stands with a past history of defoliation.

Beetle-caused mortality estimates summarized from aerial detection surveys are displayed in Table 1. Ownership status of lands infested by the various bark beetles is summarized in Tables 2 through 5. Locations of major beetle infestations are identified in Figures 1 through 4.

Mountain Pine Beetle, *Dendroctonus ponderosae* Hopkins

Trees killed	1988	63,011
	1987	181,300

IDAHO

Boise, Caribou, Payette, and Targhee National Forests - Scattered mortality is located throughout the host type.

Challis National Forest - Approximately 15,700 lodgepole pines were killed during 1988 compared to 4,750 trees in 1987. Mortality is located along the Salmon River and adjacent drainages. Heaviest infestations occurred in the Yankee Fork and Squaw Creek drainages.

Salmon National Forest - Activity increased with 7,000 trees, mostly lodgepole pines, killed in 1988 compared to 3,750 trees killed in 1987. Most mortality is located along the upper portion of Long Tom Ridge and Beartrap Ridge adjacent to the Long Tom Complex fire area.

Sawtooth National Forest - Lodgepole pine mortality continued to increase with 13,750 trees killed in 1988 compared to 11,600 trees in 1987. Activity is concentrated throughout the Big Wood River drainage from Ketchum north to Galena Summit and throughout the Deer Creek and Warm Springs Creek drainages. In the Sawtooth Valley, activity increased substantially with 6,400 trees killed in 1988 compared to 2,000 trees killed in 1987.

UTAH

Ashley and Wasatch-Cache National Forests - The infestation continued to collapse on the Ashley National Forest where approximately 8,500 ponderosa and lodgepole pines were killed in 1988

compared to 133,400 pines in 1987. On the Wasatch-Cache National Forest approximately 10,100 trees, mostly lodgepole pines, were killed during 1988 compared to 17,350 in 1987.

Dixie National Forest and Bryce Canyon National Park - Approximately 850 dying ponderosa pines were observed scattered throughout the Forest. Within Bryce Canyon National Park, approximately 100 trees were killed.

Manti-LaSal National Forest - Approximately 900 ponderosa pines were killed in the Abajo Mountains near the Gooseberry Guard Station.

WYOMING

Bridger-Teton National Forest - Mountain pine beetle activity continued to decrease throughout the Forest with approximately 900 lodgepole and limber pines killed compared to 3,200 trees killed in 1987. Most mortality is located in the upper reaches of the Gros Ventre River drainage.

Spruce Beetle, *Dendroctonus rufipennis* (Kirby)

Trees killed	1988	47,079
	1987	17,031

IDAHO

Boise National Forest - Spruce beetle activity decreased with 250 dead or dying trees observed during 1988 compared to 650 in 1987.

Payette National Forest - Spruce beetle activity continued to increase throughout the host type on the McCall, New Meadows, and Council Ranger Districts. Much of this expansion occurred in noncommercial, inaccessible areas. Approximately 44,750 dying trees were observed during 1988 compared to 15,850 trees in 1987. Aggressive salvage and trap tree programs continue in accessible commercial forest areas.

UTAH

Dixie National Forest - Ground reports indicate a low-level infestation to be present near the Brianhead Ski Area on the Cedar City Ranger District. An ongoing sanitation program has removed the infested trees within the Brianhead area, and no fading trees were observed during aerial detection surveys.

Fishlake National Forest - Approximately 700 dying spruce trees were mapped on the Forest during 1988 compared to 100 trees in 1987. Mortality occurred in the Beaver River drainage and throughout the host type on the Richfield Ranger District.

Manti-LaSal National Forest - In the Huntington Creek drainage southwest of Price, approximately 450 trees were killed by spruce beetle.

Uinta National Forest - Increasing spruce beetle activity was noted throughout the surveyed portions of the Forest. Approximately 450 infested trees were observed within the Strawberry and Duchesne Ridge areas.

Wasatch-Cache National Forest - Low levels of spruce beetle caused mortality were observed throughout the Forest.

WYOMING

Bridger-Teton National Forest - Spruce beetle activity increased but remains at a relatively low level with approximately 200 dying trees observed throughout the host type.

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopkins

Trees killed	1988	87,568
	1987	12,580

IDAHO

Boise National Forest - Approximately 33,750 Douglas-fir beetle killed trees were detected in 1988 compared to 5,050 in 1987--a six-fold increase. Mortality is located throughout the host type with mortality centers of 800 to 1,000 trees present in some drainages. In areas with recent fire activity, particularly the Anderson and Minneha Fires, Douglas-fir beetle populations have increased and moved into adjacent unburned stands.

Caribou National Forest - Douglas-fir beetle activity continued to increase on the Caribou National Forest and adjacent Bureau of Land Management, State, private, and Indian Reservation lands south of Pocatello. On National Forest land, approximately 5,000 dead trees were observed compared to 1,300 trees in 1987. Activity is located in the Scout Mountain, Elkhorn Mountain, and Oxford Peak areas and throughout the Portneuf Range.

Payette National Forest - A ten-fold increase in Douglas-fir mortality caused by the Douglas-fir beetle occurred on the Forest. Approximately 18,850 trees were killed in 1988 compared to 1,850 in 1987. Significant infestations are present in the Sturgill Peak area, along the Middle Fork of the Weiser River drainage, along the Little Weiser River, and throughout the South Fork of the Salmon River drainage. Large mortality centers are located in and around the French Creek and Savage Creek burns.

Sawtooth National Forest - Douglas-fir beetle activity increased with 4,700 dead trees detected in 1988 compared to 1,200 in 1987. Mortality is scattered throughout the South Fork of the Boise River drainage on the Fairfield Ranger District.

Targhee National Forest - Approximately 3,100 trees were killed by Douglas-fir beetle in 1988. Mortality is located along Big Bend Ridge, throughout the Big Hole Mountains, and along the Teton Ridge.

Challis and Salmon National Forests - Increasing but low levels of Douglas-fir beetle activity were observed on these Forests.

UTAH

Wasatch-Cache National Forest - Significant increases in Douglas-fir beetle activity occurred throughout the surveyed host type. Approximately 1,200 beetle attacked trees were mapped during the 1988 aerial survey compared to 150 in 1987. Large mortality centers are located throughout the Logan River drainage in trees weakened by past western spruce budworm defoliation.

WYOMING

Bridger-Teton National Forest - Douglas-fir beetle killed approximately 4,300 Douglas-firs on the Forest. An infestation on the Pinedale Ranger District killed approximately 80 trees at the Freemont Lake Campground. Quick action by District personnel to remove infested trees averted a major population increase.

Western Pine Beetle, *Dendroctonus brevicomis* LeConte

Trees killed	1988	42,706
	1987	9,926

IDAHO

Boise National Forest - Western pine beetle, sometimes intermixed with pine engraver beetle, killed approximately 32,250 trees on the Forest. Most mortality was concentrated in second-growth ponderosa pine stands in the Idaho City and Boise Basin areas. Extensive mortality was also observed throughout the Anderson Creek burn in the South Fork of the Payette River drainage.

Payette National Forest - Approximately 8,850 trees were killed by western pine beetle during 1988 compared to 1,350 trees in 1987. Major mortality occurred throughout the Weiser River drainage, along the Little Salmon River, and throughout the French Creek burn.

Jeffrey Pine Beetle, *Dendroctonus jeffreyi* Hopkins

Trees killed	1988	1,500
	1987	400

NEVADA

Toiyabe National Forest - Jeffrey pine beetle killed approximately 1,600 Jeffrey pines on the Toiyabe National Forest during 1988 compared to 400 trees in 1987. Increased activity was noted throughout the Forest; however, heaviest mortality occurred on the Carson Ranger District along Franktown Creek and throughout the Markleeville area and on the Las Vegas Ranger District in the Mount Charleston area.

DEFOLIATORS

Except for the gypsy moth outbreak located near Salt Lake City, UT, and the large aspen tortrix outbreak located on the Dixie and Fishlake National Forests, no other major outbreaks of tree defoliating insects were detected during 1988. Defoliation caused by the western spruce budworm reached the lowest level recorded in the Region since aerial surveys were begun in 1952. Approximately 8,000 acres of the 42,250 acres of detectable defoliation were classified as heavily defoliated and most of the heavy defoliation occurred on the Targhee National Forest. Acreages of trees defoliated by the western spruce budworm, and ownership status of infested lands, are summarized in Tables 6 and 7. Areas of budworm defoliation are displayed in Figure 5.

Western Spruce Budworm, *Choristoneura occidentalis* Freeman

Acres defoliated	1988	42,257
	1987	873,900

IDAHO

Boise National Forest - Three hundred and fifty acres of light and moderate defoliation were recorded in the Yuba River drainage near Atlanta.

Challis National Forest - During the annual aerial detection survey, approximately 6,250 acres of defoliation were mapped on the Forest. Defoliation was located along the main Salmon River from Yankee Fork to Squaw Creek.

Salmon National Forest - Defoliation increased from 600 acres in 1987 to approximately 5,800 acres in 1988. Most of this defoliation was located in the North Fork of the Salmon River drainage north of Salmon.

Sawtooth National Forest - Approximately 1,150 acres of light defoliation occurred along the Big Wood River north of Ketchum.

Targhee National Forest - Approximately 28,700 acres of mostly light defoliation were recorded on the Forest. Defoliation occurred along Big Bend Ridge north of Ashton.

Douglas-fir Tussock Moth, *Orgyia pseudotsugata* (McDunnough)

IDAHO

No defoliation was noted during aerial detection surveys.

Pheromone-baited detection traps were placed on the Boise, Payette, and Sawtooth National Forests; State and Bureau of Land Management lands around Bellevue, Idaho; and in the Owyhee Mountains of southwestern Idaho. Survey results indicate decreasing or static populations on the

Boise, Payette, and Sawtooth National Forests. Trap catches increased at Colson and Lick Creeks on the Salmon National Forest, at Sharps Canyon on State land, and at Dewey Peak and New York Summit in the Owyhee Mountains.

Gypsy Moth, *Lymantria dispar* L.

IDAHO

Twenty-six developed sites on National Forest land plus 60 cities or towns were monitored with pheromone-baited detection traps in southern Idaho in cooperation with the Idaho Departments of Agriculture and Lands. No gypsy moths were captured at any of these sites.

UTAH

In 1988, several gypsy moth life stages were detected in Utah. Following the initial detection of five male moths on the University of Utah campus, an intensive delimiting program using pheromone-baited traps was initiated in the Salt Lake City area near the Wasatch Mountains. The delimiting effort extended from Provo in the south to Brigham City in the north. Of the 1,737 traps placed in the field, 114 recorded multiple catches. The total male moth catch in 1988 was 1,292. Over 90 percent of the male moths caught were collected in the Holladay and Mount Olympus Cove area southeast of Salt Lake City. High male moth captures were also recorded in Millcreek, Neffs, and Big Cottonwood canyons. A multiple catch was also made in an area east of Provo, Utah.

Egg mass surveys were conducted by State and Federal personnel in areas where multiple catches occurred. Based on the results of the egg mass survey, a 1,200-acre block including a 1,000-foot buffer strip was designated for treatment in 1989.

In 1989, a statewide trapping program will be initiated to further define the infestation boundaries. Over 11,500 traps will be placed throughout the State of Utah with trap intensities increased in areas where male moths were captured in 1988. Because of the size of the infestation, eradication efforts may be required for the next 4 to 5 years.

Large Aspen Tortrix, *Choristoneura conflictana* (Walker)

Acres defoliated	1988	6,900
	1987	0

UTAH

Dixie National Forest - Approximately 3,600 acres of heavy defoliation were mapped on the Forest. Defoliation was located in the Escalante Mountains near Griffin Top on the Escalante Ranger District.

Fishlake National Forest - Three thousand three hundred acres of defoliated aspen were mapped along Shingle and Fish Creeks and along the East Fork of the Beaver River on the Beaver Ranger District.

Intermountain Region--Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho, Utah, Wyoming	Activity increased in 1988 with 87,550 trees killed by Douglas-fir beetle. Increases in beetle activity occurred on the Boise, Caribou, Challis, Payette, Salmon, Sawtooth, and Targhee National Forests, ID; on the Bridger-Teton National Forest, WY; and on the Wasatch-Cache National Forest, UT.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir	Idaho	No defoliation was observed, but moths were detected in pheromone-baited traps in southern Idaho.
Fir engraver beetle *Scolytus ventralis*	Grand fir	Idaho	Scattered 1- to 10-tree mortality centers were noted on the Boise, Payette, and Sawtooth National Forests, ID.
Gypsy moth *Lymantria dispar*	-	Idaho, Utah	No male gypsy moth were caught in pheromone-baited traps in southern Idaho in 1988. Pheromone-baited traps in the Salt Lake City area and subsequent egg mass surveys detected a sizeable infestation.
Jeffrey pine beetle *Dendroctonus jeffreyi*	Jeffrey pine	Nevada	A small number of attacked trees were detected on the Toiyabe National Forest, NV.
Large aspen tortrix *Choristoneura conflictana*	Aspen	Utah	Defoliation was detected on approximately 7,000 acres.
Locust borer *Megacyllene robiniae*	Black locust	Idaho	Locust borer continues to kill black locust trees in Boise, ID.
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, ponderosa pine, other pines	Idaho, Utah, Wyoming	Mountain pine beetle activity decreased throughout the Region. Tree mortality decreased from 181,300 trees in 1987 to 63,000 trees in 1988. Significant infestations occurred on the Boise, Challis, Salmon, and Sawtooth National Forests, ID; and ON the Ashley and Wasatch-Cache National Forests, UT.
Pine butterfly *Neophasia menapia*	Ponderosa pine	Idaho	Defoliation was not noted, but small numbers of adults were observed in ponderosa pine stands.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming--Continued

Insect	Host	Location	Remarks
Pine engraver *Ips pini*	Pines	Idaho	Significant activity often associated with western pine beetle activity was noted throughout southern Idaho. Approximately 42,700 trees were killed by these two species of beetles.
Pine needle sheathminer *Zelleria haimbachi*	Lodgepole pine	Idaho	Defoliation decreased in 1988. Scattered infestations persisted on the Boise, Payette, Sawtooth, and Targhee National Forests, ID.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Idaho, Utah, Wyoming	Epidemic populations continue to cause significant mortality on the Payette National Forest, ID. Approximately 44,750 infested trees were detected in 1988. Smaller infestations are present on the Boise National Forest, ID; on the Bridger-Teton National Forest, WY; and on the Dixie, Fishlake, Manti-LaSal, Uinta, and Wasatch-Cache National Forests, UT.
Spruce bud scale *Physokermes piceae*	Spruces	Idaho	Infestations of spruce bud scales have been detected on ornamental spruces scattered throughout southern Idaho.
Sugar pine tortrix *Choristoneura lambertiana*	Pines	Idaho	This insect often associated with pine needle sheathminer continued to cause scattered defoliation of both lodgepole and ponderosa pines.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Significant activity often associated with pine engraver beetle activity was noted throughout southern Idaho. Approximately 42,700 trees have been killed by these two species of beetles. Infestations occurred on the Boise, Payette, and Salmon National Forest, ID.
Western pineshoot borer *Eucosma sonomana*	Ponderosa pine	Idaho	Scattered infestations were noted in ponderosa pine plantations on the Boise and Payette National Forests, ID.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, spruce, true firs, western larch	Idaho	Conifers on about 42,250 acres were defoliated in 1988, compared to 873,900 acres in 1987. Infestations declined in total acreage and intensity on the Boise, Caribou, Challis, Payette, Sawtooth, and Targhee National Forests, ID; and on the Dixie and Wasatch-Cache National Forests UT.

PATHOLOGY

STEM AND BRANCH DISEASES

Stem and branch diseases of forest trees are not closely monitored because change in incidence is difficult to detect for several years. Those diseases occuring in Region 4, but whose status is not known to have changed significantly, are noted only in the summary table at the end of this report.

Dwarf Mistletoes, *Arceuthobium* spp.

Dwarf mistletoe management considerations are incorporated into most forest plans and silvicultural prescriptions for land management activities. To supplement these efforts, dwarf mistletoe suppression projects are conducted. These projects are intended to sanitize previously harvested stands or those ravaged by bark beetles where infected trees remained and now threaten infection of established regeneration. The greatest advances in identifying and removing dwarf mistletoe infected overwood, and then successfully regenerating the sites, have occurred in the numerous stands of mountain pine beetle killed lodgepole pine on the Targhee and Sawtooth National Forests in southeastern and south central Idaho, respectively, and on the Ashley and Wasatch-Cache National Forests in Utah.

In Region 4, the dwarf mistletoe management program is a process of education, pre-suppression survey, evaluation, control, and post-control evaluation. Accomplishments for 1988 are reported in Table 8.

ROOT DISEASES

As with stem and branch diseases, root diseases of forest trees are difficult to monitor closely. Known root pathogens of forest trees are noted in the summary table. Diseases, primarily root diseases, causing root malformation and mortality of nursery grown seedlings are closely monitored, and their status is briefly discussed.

Root disease of nursery seedlings, *Fusarium* spp., *Pythium* spp., *Phytopthora* spp.

In 1988, the occurrence of three genera of potential conifer seedling root pathogens were monitored at the Lucky Peak Nursery, Boise National Forest, prior to and following fumigation with a granular application of dazomet. *Fusarium* spp., *Pythium* spp., and *Phytopthora* spp. were identified with wide variances in population levels being noted between fields. While post-fumigation levels of all three fungi were sufficiently reduced initially, *Fusarium* spp. populations resurged to levels comparable to control plots within 2 months. Nevertheless, seedling mortality rates were similar to those observed previously when other fumigation techniques were utilized.

FOLIAGE DISEASES

Douglas-fir Needle Cast, *Rhabdocline* sp.

Epidemic infections of Douglas-fir by the Douglas-fir needle cast fungus were noted throughout southern Idaho. In the spring, reddish-brown needles on the 1987 growth were common. By midsummer, infected needles were cast, or the needle symptoms caused by the infection were masked by the healthy appearance of the new growth flush.

VASCULAR WILTS

Dutch Elm Disease, *Ceratocystis ulmi* (Buism.) C. Mor.

The City of Boise, Idaho, has a street-tree population of around 1,700 elm trees, down from over 4,000 trees a decade ago. In 1988, 31 trees succumbed to dutch elm disease out of over 75 elms removed for all reasons. The long-range plan for the City is to replace elms with trees requiring less maintenance.

Ash Yellows, mycoplasmalike oraganism

Ash yellows, caused by a mycoplasmalike organism (MLO), was detected by Dr. Wayne Sinclair in southern Utah. He observed several declining and dead velvet ash (*Fraxinus velutina*) near the main headquarters and lodge in Zion National Park. He later confirmed the presence of ash yellows in branch samples. No affected trees were detected elsewhere in the Park. This location and Las Vegas, Nevada, are the only known infection centers in the western United States. Ash yellows is causing decline and mortality of ash in some areas of the north-central and northeastern United States and adjacent Canadian provinces. It is not currently known how susceptible velvet ash is to the MLO associated with ash yellows.

ABIOTIC DAMAGE

Drought Effects

The drought of 1986-1988, widespread throughout the Intermountain Region, affected forest and urban trees in various ways. Mature coniferous trees, especially ponderosa pine, abcissed older needles prematurely throughout stands in southern Idaho. Dead, dying, and discolored Douglas-fir and ponderosa pine seedlings were noted along roadcuts and in exposed openings around Salmon,

Idaho, and on the Payette National Forest. These trees were apparently stressed by low moisture during the summer and fall of 1987 and likely experienced winter drying the following winter. These seedlings had varying amounts of foliage discoloration and many later died. The foliage on box elder trees in American Fork and Provo canyons east of Provo, Utah, was "bleached" on the leaf margins and interveinal areas. In the urban areas, maples and ash trees exhibited leaf scorch.

Intermountain Region--Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
STEM AND BRANCH DISEASES			
Aspen trunk rot *Phellinus tremulae*	Aspen	Idaho, Nevada, Utah, Wyoming	Decay occurs in most aspen stands in the Region.
Comandra blister rust, *Cronartium comandrae*	Lodgepole pine, ponderosa pine	Idaho, Utah, Wyoming	Infections occur infrequently on lodgepole pine in Idaho, Utah, and Wyoming and infrequently on ponderosa pine across southern Idaho.
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, lodgepole pine, ponderosa pine, western larch, Jeffrey pine	Idaho, Nevada, Utah, Wyoming	These continue to be the most widespread and frequently observed pests in southern Idaho. Suppression projects removed infected overstory trees from 3,848 acres.
Limb rust *Peridermium filamentosum*	Ponderosa pine	Utah	Infection was detected in stands on the Dixie National Forest, UT.
Red ring rot *Phellinus pini*	Western larch, true firs, spruce, Douglas-fir, pines	Idaho, Utah, Wyoming	This fungus occurs throughout the Region in stands of mature conifers. Infection intensity is highly variable.
Rust-red stringy rot, *Echinodontium tinctorium*	Grand fir, white fir, subalpine fir	Idaho, Nevada	Decay caused by this fungus is common in mature and overmature stands of true firs.
Stalactiform blister rust, *Cronartium coleosporioides*	Lodgepole pine	Idaho, Utah, Wyoming	This rust occurs in localized areas of host type across the Region. Heavy infection has been noted in several areas.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, ponderosa pine	Idaho, Utah, Wyoming	Gall rust occurs throughout host types. Infection levels are highly variable.
ROOT DISEASES			
Annosus root disease *Heterobasidion annosum*	Douglas-fir, lodgepole pine, ponderosa pine, true firs,	Idaho, Nevada, Utah, Wyoming	This fungus commonly causes root and butt rot of true firs and root rot of young ponderosa pines. Infection frequently results in death of young ponderosa pines. Infrequent root infection has been noted on Douglas-fir.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming--Continued

Disease	Host	Location	Remarks
Armillaria root disease *Armillaria* sp.	Douglas-fir, grand fir, pines, spruce	Idaho, Utah, Wyoming	While evidence of *Armillaria* may be found throughout the Region, in most instances it functions as a weak pathogen or saprophyte.
Black stain root disease, *Ceratocystis wageneri*	Pinyon pine	Idaho, Nevada, Utah	This disease infects pinyon pine on the BLM Burley District, ID; on the Humboldt and Toiyabe National Forests, NV; and on the Manti-LaSal National Forest, UT.
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, ponderosa pine	Idaho	Decay is common in mature and overmature forests, especially those having a recent fire or logging history. The fungus is often found associated with other root diseases and bark beetles.
Tomentosus root disease, *Inonotus tomentosus*	Douglas-fir, spruce, subalpine fir	Idaho, Utah	The fungus is commonly found with *P. schweinitzii* as a root/butt rot of pole-size Douglas-fir and spruce--less often of subalpine fir--in southern Idaho. Infection may result in occasional mortality.
FOLIAGE DISEASES			
Ash yellows	Velvet ash	Utah	Several dead and declining velvet ash trees were found in Zion National Park. In addition to an infection center located in Las Vegas, NV, this is the only other reported site in the western U.S.
Douglas-fir needlecast *Rhabdocline* spp.	Douglas-fir	Idaho	Widespread occurrence was observed but only light to moderate defoliation was noted throughout the range of Douglas-fir in southern and eastern Idaho.
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho	Moderate levels of infection were noted in stands on Little Donner Summit, Cascade, ID, and in Manhattan Creek, Idaho City, ID.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Idaho, Utah, Wyoming	Infection occurs scattered throughout the host type, but high infection levels have been noted in forested areas south of Twin Falls and Burley, ID.
Fir needle cast *Lirula* spp.	Subalpine fir, grand fir	Idaho	Infected stands were found on the Council and Weiser Ranger Districts of the Payette National Forest, ID.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming--Continued

Disease	Host	Location	Remarks
Fir needle rust *Pucciniastrum* sp.	Subalpine fir	Idaho	Seedling or sapling size trees at higher elevations around McCall, ID, were heavily infected.
Larch needle cast *Meria laricis*	Western larch	Idaho	Incidence and severity of infection throughout the host type in west-central Idaho were very low.
Limber pine needle cast, *Lophodermella arcuata*	Limber pine	Wyoming	The disease, previously observed on the Bridger-Teton National Forest, WY, was not observed in 1988.
Marssonina blight *Marssonina populi*	Aspen	Idaho, Utah, Wyoming	Scattered incidence of light intensity was noted throughout most of the host range.
Spruce broom rust *Chrysomyxa arctostaphyli*	Engelmann spruce	Idaho, Utah, Wyoming	Infection occurs scattered throughout the host type--it is common in eastern Idaho.
ABIOTIC			
Drought Effects	All vegetation	Regionwide	Premature needle drop, leaf scorch, and seedling mortality was observed due to 3 consecutive years of subnormal precipitation. Damage was most acute in southern Idaho.
NURSERY			
Fusarium Root Disease *Fusarium oxysporum*	Nursery grown conifer seedlings	Idaho	Mortality of 1-0 and 2-0 conifer seedlings occurred at the Lucky Peak Nursery, Boise National Forest, ID.
Fusarium Cortical Stem Rot *Fusarium avenaceum*	Nursery grown conifer seedlings	Idaho	Mortality of 1-0 and 2-0 conifer seedlings occurred at the Lucky Peak Nursery, Boise National Forest, ID.
Phytopthora/Pythium Root Rot *Phytopthora* spp. *Phythium* spp.	Spruce	Idaho	These fungi were identified on seedlings and soil isolations at the Lucky Peak Nursery, Boise National Forest, ID.

TABLE 1. Number of trees killed by *bark beetles* in Region 4 during 1987-1988 as determined by aerial detection surveys.

Forest* & Adjacent Land	Year	Mountain Pine Beetle	Trend	Douglas Fir Beetle	Trend	Ips/ Western Pine Beetle	Trend	Spruce Beetle	Trend
Ashley	1988	8,521	decrease	--	--	--	--	--	--
	1987	133,409	--	--	--	--	--	--	--
Boise	1988	4,443	static	33,759	increase	32,254	increase	254	decrease
	1987	4,518	--	5,027	--	7,907	--	669	--
Bridger-Teton	1988	890	decrease	4,283	increase	--	--	183	increase
	1987	3,224	--	1,721	--	--	--	--	--
Caribou	1988	--	--	20,662	increase	--	--	--	--
	1987	182	--	1,262	--	--	--	--	--
Challis	1988	15,707	increase	176	increase	--	--	--	--
	1987	4,730	--	--	--	--	--	--	--
Dixie	1988	843	increase	--	--	--	--	99	increase
	1987	217	--	--	--	--	--	--	--
Fishlake	1988	--	--	--	--	--	--	685	increase
	1987	--	--	--	--	--	--	105	--
Manti-LaSal	1988	920	increase	--	--	--	--	458	increase
	1987	280	--	63	--	--	--	300	--
Payette	1988	517	decrease	18,857	increase	8,829	increase	44,756	increase
	1987	1,287	--	1,855	--	1,364	--	15,873	--
Salmon	1988	7,020	increase	845	increase	1,623	increase	--	--
	1987	3,754	--	79	--	602	--	--	--
Sawtooth	1988	13,737	static	4,687	increase	--	--	--	--
	1987	11,609	--	1,200	--	53	--	--	--
Targhee	1988	335	static	3,114	increase	--	--	--	--
	1987	735	--	1,220	--	--	--	--	--
Uinta	1988	--	--	--	--	--	--	447	increase
	1987	--	--	--	--	--	--	84	--
Wasatch-Cache	1988	10,078	decrease	1,185	increase	--	--	197	increase
	1987	17,355	--	153	--	--	--	--	--
TOTAL	1988	63,011		87,568		42,706		47,079	
	1987	181,300		12,580		9,926		17,031	

* Only portions of Forests flown; actual mortality figures are probably considerably higher.

TABLE 2. Status of *mountain pine beetle* infestations by state during 1988.

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	27.3	38.5
Other Federal	0.8	1.1
State and Private	1.6	2.2
TOTAL	29.7	41.8

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	11.9	19.4
Other Federal	0.2	0.4
State and Private	0.4	0.6
TOTAL	12.5	20.4

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.6	1.0
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.6	1.0

TABLE 3. Status of *spruce beetle* infestations by state during 1988.

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	34.7	42.8
Other Federal	0.0	0.0
State and Private	1.8	2.2
TOTAL	36.5	45.0

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	1.7	2.0
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	1.7	2.0

TABLE 4. Status of *Douglas-fir beetle* infestations by state during 1988.

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	48.0	60.0
Other Federal	1.3	1.6
State and Private	16.4	20.5
TOTAL	65.7	82.1

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	1.1	1.2
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	1.1	1.2

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	3.5	4.1
Other Federal	0.1	0.1
State and Private	0.1	0.1
TOTAL	3.7	4.3

TABLE 5. Status of *western pine beetle* infestations by state during 1988.

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	46.3	35.4
Other Federal	1.1	0.8
State and Private	8.4	6.5
TOTAL	55.8	42.7

TABLE 6. Acres of defoliation by *western spruce budworm* in Region 4 during 1987-1988 as determined by aerial detection surveys.

		Defoliation Intensity				
Forest* and Adjacent Land	**Year**	**Light**	**Moderate**	**Heavy**	**Total**	**Change**
Boise	1988	178	160	0	338	- 426,362
	1987	337,400	58,000	31,300	426,700	
Bridger-Teton	1988	0	0	0	0	- 1,400
	1987	1,400	0	0	1,400	
Caribou	1988	0	0	0	0	- 52,000
	1987	32,300	15,100	4,600	52,000	
Challis	1988	4,002	869	1,371	6,242	- 14,658
	1987	16,900	4,000	0	20,900	
Dixie	1988	0	0	0	0	- 12,300
	1987	5,000	3,300	4,000	12,300	
Payette	1988	0	0	0	0	- 134,800
	1987	119,000	15,800	0	134,800	
Salmon	1988	4,313	1,335	164	5,812	+ 5,212
	1987	60	540	0	600	
Sawtooth	1988	1,173	0	0	1,173	- 82,927
	1987	65,000	18,200	900	84,100	
Targhee	1988	20,797	1,444	6,451	28,692	- 86,708
	1987	104,400	9,200	1,800	115,400	
Wasatch-Cache	1988	0	0	0	0	- 25,400
	1987	10,000	15,400	0	25,400	
R-4 TOTALS	1988	30,463	3,808	7,986	42,257	- 831,343
	1987	691,460	139,540	42,600	873,600	

*Only portions of Forests flown; actual acreage may be greater

TABLE 7. Status of *Western Spruce Budworm* by State during 1988.

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)
National Forest	38.2
Other Federal	3.0
State and Private	1.0
TOTAL	42.2

TABLE 8. *Dwarf mistletoe* **accomplishments - Intermountain Region, 1988.**

National Forest	Presuppression Survey Acres	Suppression Project Acres	Post-Suppression Evaluation Acres
Ashley	520	160	200
Boise	51,020	500	670
Bridger-Teton	330	200	0
Caribou	600	55	0
Challis	3,280	95	100
Dixie	720	280	1,100
Fishlake	330	0	0
Payette	500	338	0
Salmon	0	258	0
Sawtooth	0	56	0
Targhee	28,188	1,066	16
Toiyabe	0	150	0
Uinta	0	150	0
Wasatch-Cache	800	540	500
TOTAL	86,288	3,848	2,586

FIGURE 1. Areas infested by mountain pine beetle in the Intermountain Region during 1988 as observed during aerial detection surveys.

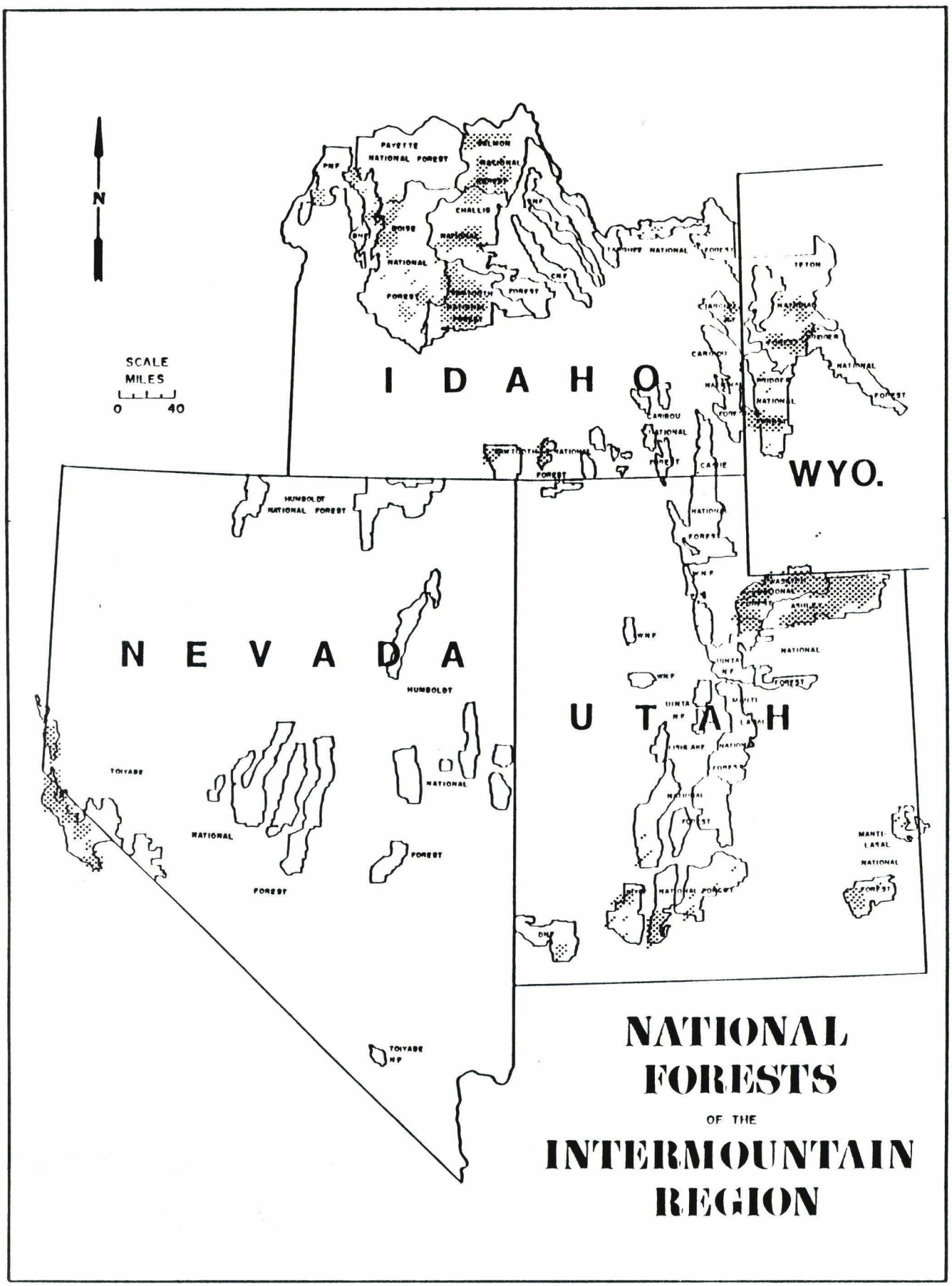


FIGURE 2. Areas infested by spruce beetle in the Intermountain Region during 1988 as observed during aerial detection surveys.

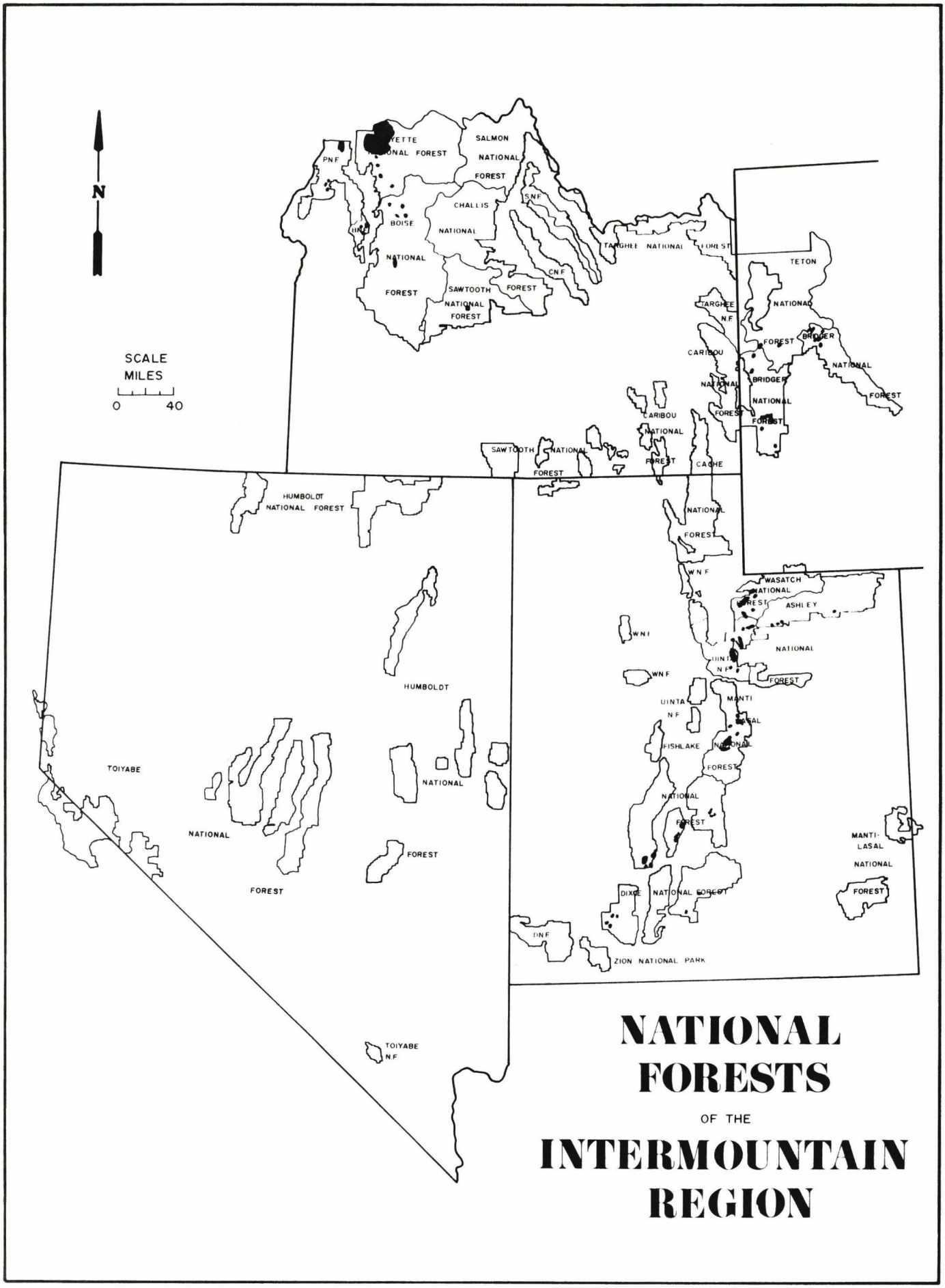


FIGURE 3. Areas infested by Douglas-fir beetle in the Intermountain Region during 1988 as observed during aerial detection surveys.

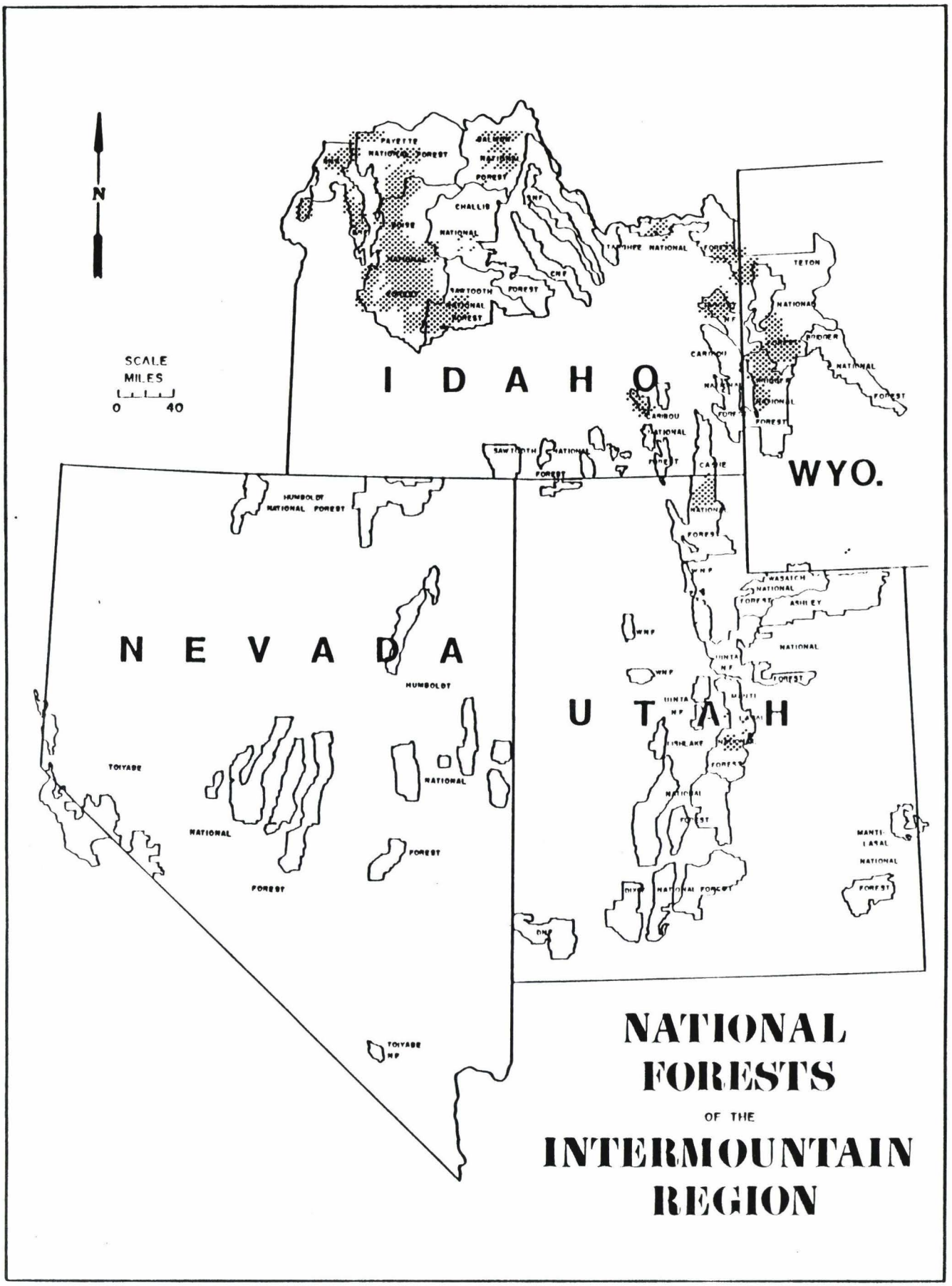


FIGURE 4. Areas infested by western pine beetle and pine engraver beetle on the Boise and Payette National Forests during 1988 as observed during aerial detection surveys.

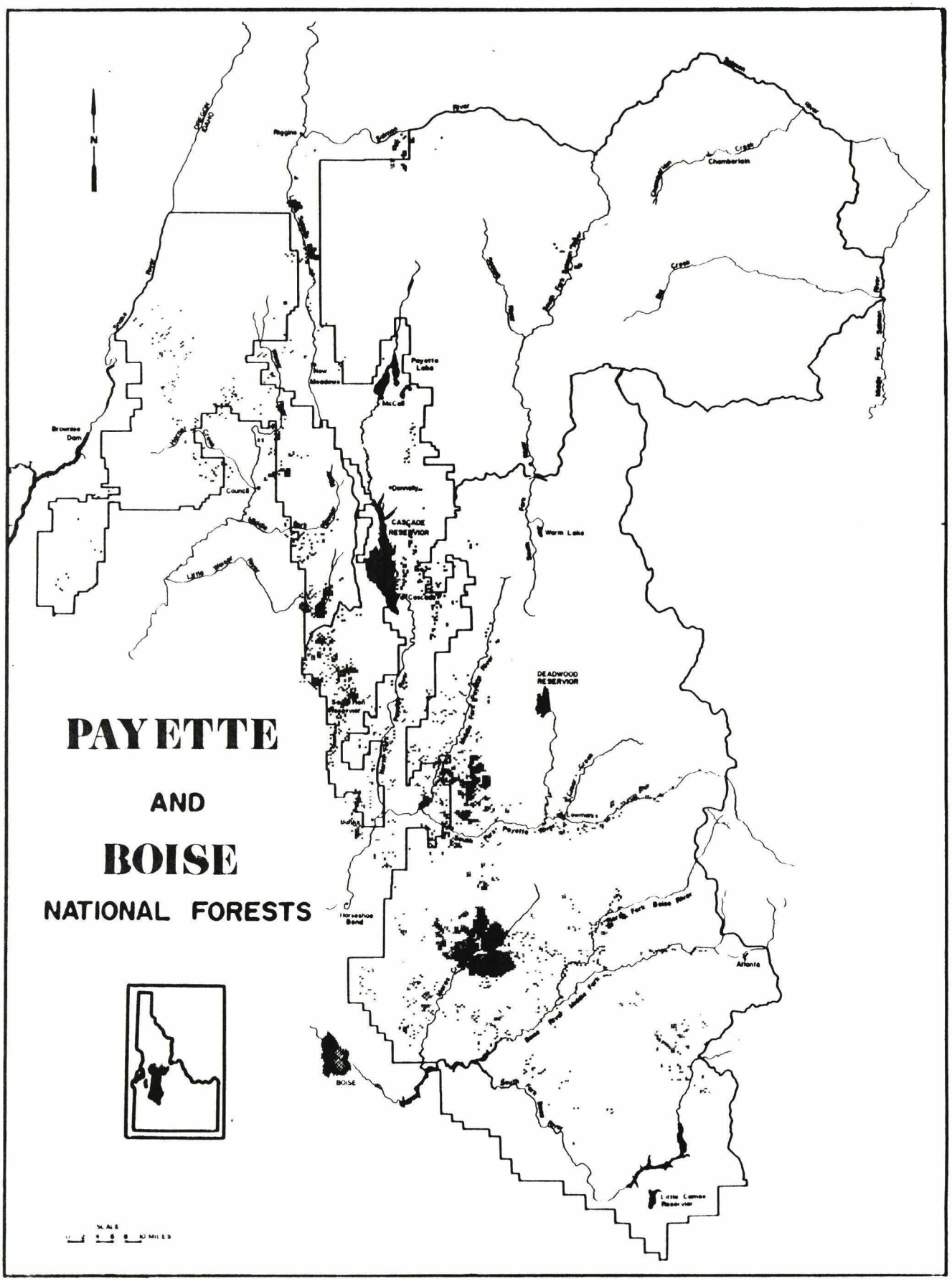
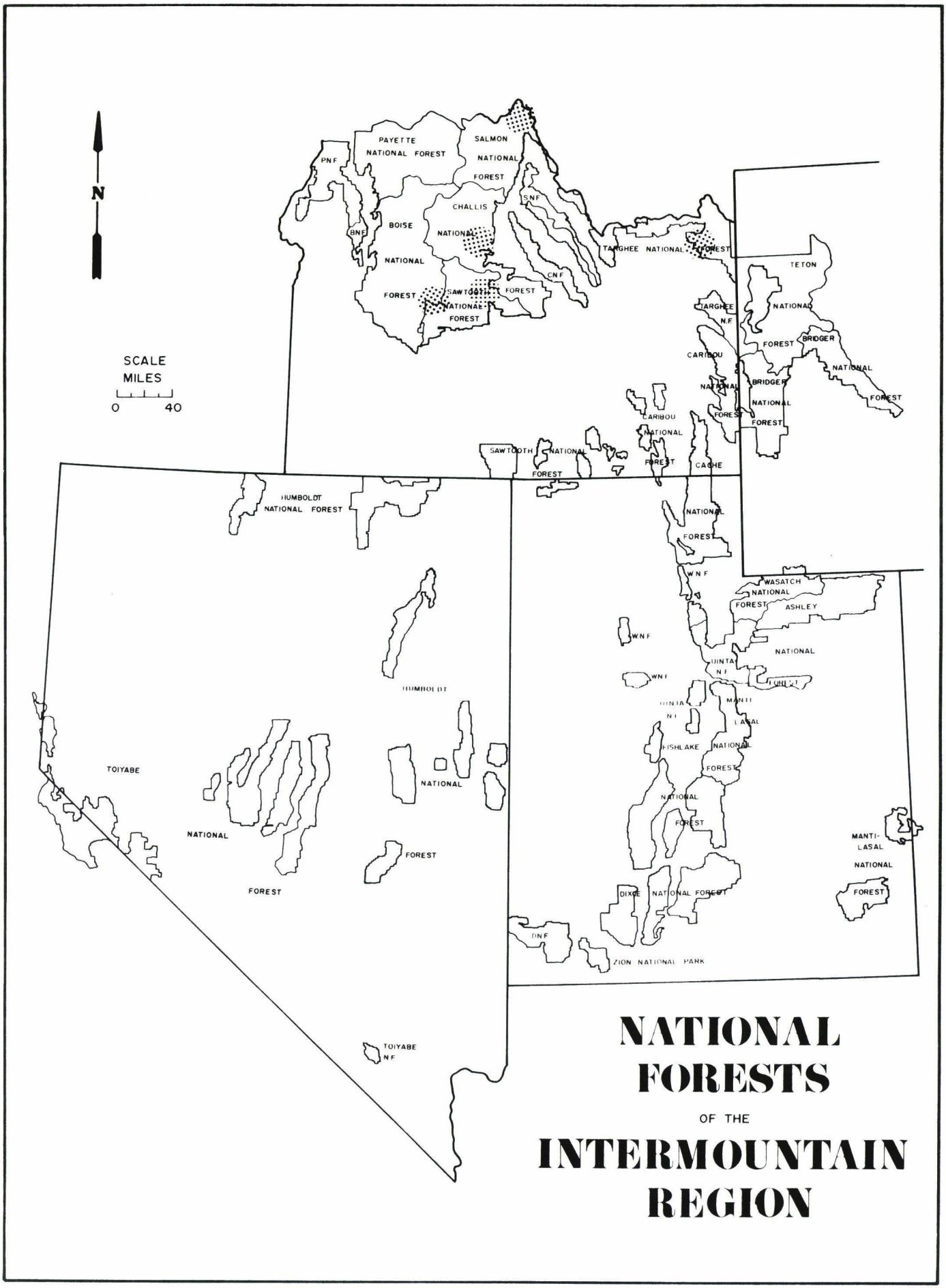


FIGURE 5. Areas infested by western spruce budworm in the Intermountain Region during 1988 as observed during aerial detection surveys.



RECENT PUBLICATIONS

Anhold, J.A. 1988. Western spruce budworm egg mass survey, Beaver Mountain Logan RD, Wasatch-Cache National Forest. FPM Report 88-2. Ogden, UT: USDA Forest Service, Intermountain Region. 5 p.

Anhold, J.A. 1988. Evaluation of preventive treatment for mountain pine beetle in high-value stands of lodgepole pine. FPM Report 88-3. Ogden, UT: USDA Forest Service, Intermountain Region. 8 p.

Forest Pest Management. 1988. Biological evaluation of a mountain pine beetle infestation on the Sawtooth National Recreation Area, Idaho - 1987. FPM Report 88-4. Ogden, UT: USDA Forest Service, Intermountain Region. 9 p.

Hoffman, J.T. 1988. Dwarf mistletoe suppression program in Region 4: 1977 - 1992. FPM Report 88-5. Ogden, UT: USDA Forest Service, Intermountain Region. 7 p.

Hoffman, J.T., Keysor, A., Knapp, A., and Weatherby, J. 1988. Forest Insect and Disease Conditions, Intermountain Region 1987. FPM Report. Ogden, UT: USDA Forest Service, Intermountain Region. 20 p.

Hoffman, J.T., and Williams, R.E. 1988. Evaluation of spring-applied Basamid to control soil-borne root pathogens at Lucky Peak Nursery, Idaho. FPM Report 88-11. Ogden, UT: USDA Forest Service, Intermountain Region. 7 p.

Keysor, A.M. 1988. Post-control evaluation of dwarf mistletoe, Kelly Guard Station Area, Kemmerer Ranger District, Bridger-Teton National Forest. FPM Report 88-7. Ogden, UT: USDA Forest Service, Intermountain Region. 4 p.

Keysor, A.M. 1988. Evaluation of dwarf mistletoe control projects, Ashley National Forest. FPM Report 88-8. Ogden, UT: USDA Forest Service, Intermountain Region. 8 p.

Keysor, A.M. 1988. Evaluation of dwarf mistletoe control projects, Escalante Ranger District, Dixie National Forest. FPM Report 88-9. Ogden, UT: USDA Forest Service, Intermountain Region. 6p.

Knapp, K.A. 1988. The 1987 western spruce budworm conditions in the Intermountain Region. FPM Report 88-10. Ogden, UT: USDA Forest Service, Intermountain Region. 19 p.

Livingston, R.L., Schwandt, J.W., Beckman, D.P., Gast, S., James, R.L., Knapp, K.A., Hoffman, J.T., and Weatherby, J. 1988. Idaho Forest Pest Conditions and Program Summary, 1987. Report No. 88-1. Coeur d'Alene, ID: Idaho Department of Lands, Bureau of Private Forestry. 28 p.

Tkacz, B.M. 1988. Evaluation of two soil fumigants at the Lone Peak State Nursery. FPM Report 88-6. Ogden, UT: USDA Forest Service, Intermountain Region. 9 p.

Weatherby, J.C. 1988. Douglas-fir tussock moth monitoring in southern Idaho, 1987. FPM Report 88-1. Ogden, UT: USDA Forest Service, Intermountain Region. 7 p.